DECLARATION

Serial No.: 10/550,813
U.S. Filing Date: Jul. 17, 2006

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and may jeopardize the validity of the application or any patent issuing thereon.
I am thoroughly familiar with the contents of said Application, and the references cited therein.

I have been employed by Shimadzu Corporation since 2002 as an application engineer in the field of biochemistry;

The experiments in the following TEST REPORT was carried out by me.

Date: Dec. 5, 2008 Masaru Furuta

Masaru Furuta

TEST REPORT

Date of experiment: 16-SEP-08
Place of experiment: Shimadzu Corporation, 1, Nishinokyo-Kuwabaracho, Nakagyo-ku, Kyoto Japan
Test Operator: Masaru Furuta

1. Title: Effects of pneumatic control to dispensing small amount of solution

2. Purpose:

This test is to confirm and prove effects of controlling a fluid meniscus at the orifice of the piezoelectric dispensing tube by pneumatic control to dispensing small amount of solution with piezoelectric system.

3. Solution: IPA-H_2O 50(v/v)%

4. System
CHIP-1000

5. Experiment:

1) System:

The CHIP-1000 is equipment manufactured by Shimadzu Corporation, and corresponds to one disclosed in the present application. The CHIP-1000 has reservoirs and piezoelectric dispensing tubes identical to that shown in Fig. 5 and that shown in Fig.3 respectively in the present application.

2) Pneumatic condition / Printing condition:

-0.13 – -0.01kPa for printing without pneumatic control.
-0.45kPa for printing with pneumatic control.

The fluid meniscus at the orifice of the piezoelectric dispensing tube was controlled through pneumatic condition by adjusting a control valve. First the pneumatic condition was adjusted around -0.3 – -0.4kPa to get a stable droplet

dispensing by making the fluid meniscus plane (with pneumatic control), and then the valve was opened to atmospheric pressure (without pneumatic control).

The fluid meniscus of the solution and the droplets being dispensed from the orifice of the piezoelectric dispensing tube were observed with a strobe light (electric flash) in synchronization with the timing of the discharging the droplets from the orifice. If the droplets are discharged in a stable state, the images of the droplets should be obtained as a static image since the images of sequentially discharged droplets are captured with the same timing.

3) Result:

The attached images show printing for each (with or without) pneumatic condition:

With pneumatic control, static image was found as shown in Fig. 2, which means small amount of solution was discharged in a stable state.

However, without pneumatic control, such a static image was not found as shown in Fig. 1, which means small amount of solution was not discharged in a stable state.

Masaru Furuta

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Effects of controlling a fluid meniscus at the orifice of the piezoelectric dispensing tube by pneumatic control to dispensing small amount of solution

Observation of printing solution (IPA 50%) was carried out in two ways –without pneumatic control (open to atmospheric pressure), and with pneumatic control. Fig.1 is a result without pneumatic control (In the experiment, a control valve was opened to atmospheric pressure after printing in stable state with pneumatic control), and Fig. 2 is a result with pneumatic control. A stable droplet being dispensed from the orifice is found in Fig. 2.The volume of the droplet is about 87 pl.However, such a stable droplet is not found in Fig. 1.

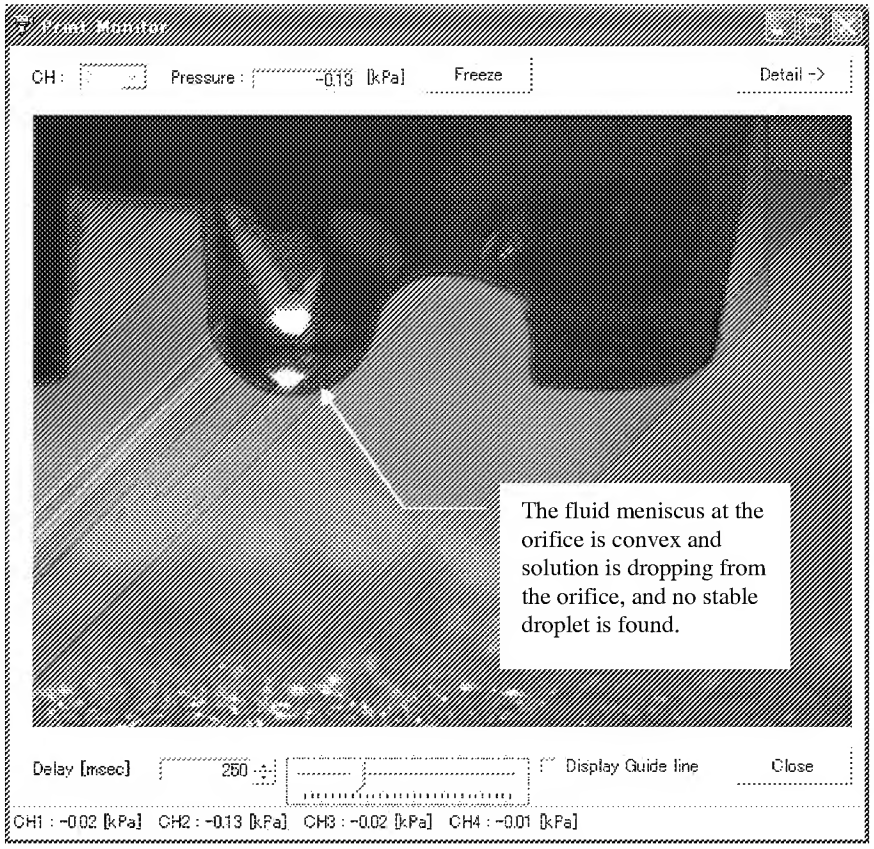

Fig. 1 Printing without pneumatic control

- monitor image with using electric flash.

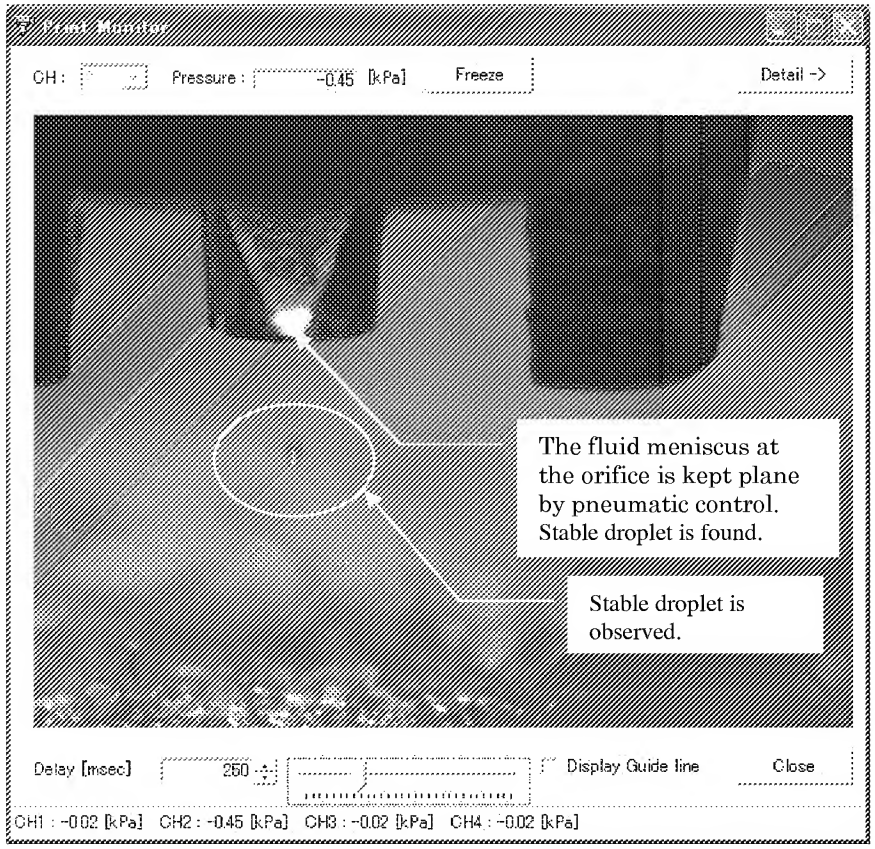

Fig. 2 Printing with pneumatic control

- monitor image with using electric flash